# Off-Road Large Spark-Ignition (LSI) Equipment Regulation Proposed Amendments

## Public Workshop

<table>
<thead>
<tr>
<th>Date and Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 8, 2015 - 10:00 am -</td>
<td>Cal EPA Building</td>
</tr>
<tr>
<td>12:00 pm PDT</td>
<td>Byron Sher Auditorium</td>
</tr>
<tr>
<td></td>
<td>Sacramento, CA 95812</td>
</tr>
<tr>
<td>June 10, 2015 - 10:00 am -</td>
<td>San Joaquin Valley Air Pollution Control District</td>
</tr>
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<td>12:00 pm PDT</td>
<td>Auditorium</td>
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<tr>
<td></td>
<td>1990 E. Gettysburg Ave.</td>
</tr>
<tr>
<td></td>
<td>Fresno, CA 93726</td>
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<tr>
<td>June 12, 2015 - 10:00 am -</td>
<td>South Coast Air Quality Management District</td>
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<tr>
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<tr>
<td></td>
<td>21865 Copley Drive</td>
</tr>
<tr>
<td></td>
<td>Diamond Bar, CA 91765</td>
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**California Environmental Protection Agency**  
**Air Resources Board**
Overview

• Introductions
• Background
• Current LSI Regulation
• Proposed Amendment Concepts
• Important Dates/Contact Information
• Discussion
Need for Emission Reductions

- Minimize Near-Source Health Risk
- Help Meet California Goals
  - 90% Oxides of Nitrogen (NOx) by 2032
  - 50% Petroleum by 2030
  - 80% Greenhouse Gas (GHG) by 2050
ARB Sustainable Freight Plan
Significant Opportunities for Zero-Emission Deployments

Long-term Goal: Expand zero emission, where feasible, in off-road sector through a coordinated incentive and regulatory approaches

• Roughly 50% of forklifts are already electrified
• 90-95% of forklifts with up to 8,000 lbs. lift capacity (~3/4 of market) can operate using today’s zero-emission technology without significant change in workflow
• Fuel cell forklifts: ~5,000 in U.S. <1% zero-emission forklift market
**Large Spark-Ignited (LSI) Regulation**

**LSI Engine Emission Standards**
- Gasoline, Propane, CNG
- 25hp or greater, >1L displacement
- Self-propelled

**Fleet Average Requirements**
- Forklifts
- Industrial Tractors
- Sweepers/Scrubbers
- Airport Ground Support Equipment (GSÉ)
## Estimated Statewide LSI Emissions

### LSI Equipment Emissions Statewide Annual Average in tons per day (t/d)

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
<th>HC</th>
<th>NOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>87,687</td>
<td>15.4</td>
<td>54.8</td>
</tr>
<tr>
<td>2010</td>
<td>92,104</td>
<td>7.5</td>
<td>28.3</td>
</tr>
<tr>
<td>2020</td>
<td>96,964</td>
<td>4.4</td>
<td>19.0</td>
</tr>
</tbody>
</table>

### LSI Equipment Emissions Top Three Equipment Categories (t/d)

<table>
<thead>
<tr>
<th>Equipment Category</th>
<th>2004</th>
<th>2010</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HC</td>
<td>NOx</td>
<td>HC</td>
</tr>
<tr>
<td>Industrial Forklifts</td>
<td>11.8</td>
<td>40.4</td>
<td>5.3</td>
</tr>
<tr>
<td>Airport GSE</td>
<td>0.6</td>
<td>3.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Sweeper/Scrubbers</td>
<td>0.2</td>
<td>0.8</td>
<td>0.1</td>
</tr>
</tbody>
</table>
Controlling LSI Engine Emissions

- New Engine Emission Requirements
- Automotive – style controls
- Three-way catalytic converters
- Fuel/Air Control
- Retrofit kits available for older engines (Model Year (MY) 1980 – 2003)
LSI Fleet Average Requirements

- Forklifts
- Sweepers/Scrubbers
- Industrial Tow Tractors
- Airport GSE
- Powered by LSI Engine

Current Regulation
For the purposes of the LSI Fleet Regulation

“Forklift” means:
- Electric Class 1 or 2 rider truck
- LSI engine-powered Class 4 or 5 rider truck

“Forklift” does not mean:
- Electric Class 3 truck (e.g., pallet jacks & walkies)
- Man lifts, scissors lifts, and bucket/boom lifts
Sweeper/Scrubber

• “Sweeper/scrubber” means an electric motor powered or large spark-ignition engine-powered piece of industrial floor cleaning equipment

• Designed to vacuum up small debris (litter) and/or scrub and squeegee the floor
Industrial Tow Tractor

• “Industrial Tow Tractor” means an electric motor or LSI engine **Class 6** truck as defined by the Industrial Truck Association

• Designed primarily to push or pull non-powered trucks, trailers, or other mobile loads on roadways or improved surfaces

• Commonly referred to as tow motors or tugs

• Tow tractors used at airports are included in GSE Fleet definition
Airport Ground Support Equipment (GSE)

- LSI engine
- Some electric-powered equipment
- 23 subcategories

<table>
<thead>
<tr>
<th>Air Conditioner</th>
<th>Cart</th>
<th>Lavatory Cart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Start</td>
<td>Catering Truck</td>
<td>Lavatory Truck</td>
</tr>
<tr>
<td>Aircraft Tractor</td>
<td>De-icer</td>
<td>Lift</td>
</tr>
<tr>
<td>Baggage Tractor</td>
<td>Fork Lift</td>
<td>Passenger Stand</td>
</tr>
<tr>
<td>Belt Loader</td>
<td>Fuel Truck</td>
<td>Service Truck</td>
</tr>
<tr>
<td>Bobtail</td>
<td>Generator</td>
<td>Sweeper</td>
</tr>
<tr>
<td>Cargo Loader</td>
<td>Ground Power Unit</td>
<td>Water Truck</td>
</tr>
<tr>
<td>Cargo Tractor</td>
<td>Hydrant Truck</td>
<td></td>
</tr>
</tbody>
</table>

- Includes “On-Road Equivalent GSE,” those pieces of GSE designed for, but not licensed for on-road use
Exemptions to the LSI Fleet Regulation

• Small Fleets
  - 3 or fewer forklifts, and/or
  - 3 or fewer pieces of non-forklift LSI engine equipment

• In-field forklifts

• Rental or leased equipment operated 30 or fewer aggregated calendar days per year

• Tactical support equipment
Fleet Size/Type Considerations

• Two Separate fleets
  - Forklift
  - Non-forklift
  - For each, include electric equipment

• Forklift fleets
  - Medium (4-25)
  - Large (26+)

• Equipment must be added together into a single fleet if procurement decisions and/or budgeting for facility locations occur at a higher corporate level.
## Fleet Average Emission Standards

Fleet Average Emission Level Standard in Grams HC+NOx per kilowatt-hour (g/kW-hr) (brake horsepower-hour)

<table>
<thead>
<tr>
<th>LSI Fleet Type</th>
<th>Number of units</th>
<th>By 1/1/2009</th>
<th>By 1/1/2011</th>
<th>By 1/1/2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forklift – large fleet</td>
<td>26+</td>
<td>3.2 (2.4)</td>
<td>2.3 (1.7)</td>
<td>1.5 (1.1)</td>
</tr>
<tr>
<td>Forklift – mid-size fleet</td>
<td>4-25</td>
<td>3.5 (2.6)</td>
<td>2.7 (2.0)</td>
<td>1.9 (1.4)</td>
</tr>
<tr>
<td>Non-forklift – GSE, tow tractor, sweeper</td>
<td>4+</td>
<td>4.0 (3.0)</td>
<td>3.6 (2.7)</td>
<td>3.4 (2.5)</td>
</tr>
</tbody>
</table>

* GSE forklifts must comply with the forklift standards
Fleet Average Exclusions

• Limited Hours of Use
  - Less than 200 based on prior year

• Rental or lease equipment where:
  - Agreement is less than one year; and
  - Meets a 2.7 g/kW-hr standards; and
  - No more than 20 % of fleet (otherwise, the exclusion applies only to first 20%)

• Boneyard and Retired equipment
# Calculating the Fleet Average

- Not based on hours of use, hp, or source test
- Straight average of HC+NOx certification/verification standards or a default value for uncontrolled engines

<table>
<thead>
<tr>
<th>Engine Category</th>
<th>HC+NOₓ Emission Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-2001 model years</td>
<td>16.0 g/kW-hr (12.0 g/bhp-hr)</td>
</tr>
<tr>
<td>Uncontrolled 2001-2003 MY</td>
<td></td>
</tr>
<tr>
<td>Controlled 2001-2003 MY</td>
<td>4.0 g/kW-hr (3.0 g/bhp-hr)</td>
</tr>
<tr>
<td>2004 to 2006 MY</td>
<td></td>
</tr>
<tr>
<td>2007 to 2009 MY</td>
<td>0.8 - 2.7 g/kW-hr</td>
</tr>
<tr>
<td></td>
<td>(0.6 - 2.0 g/bhp-hr)</td>
</tr>
<tr>
<td>2010+ MY</td>
<td>0.8 g/kW-hr (0.6 g/bhp-hr)</td>
</tr>
</tbody>
</table>
Special Provisions

- Equipment Dealers Provisions
- Specialty Equipment Exemptions
- Agricultural Provisions
- GSE Provisions
Recordkeeping Requirements

• Current LSI regulation has no reporting requirements
  – Baseline inventory Nov. 2007
  – Contents: vehicle/engine make, model, serial number, certification, or verification level as shown on label
  – May be retained at a centralized location

• Records of fleet inventories through June 30, 2016
Near-Term Objective

• Provide needed State wide emission inventory updates
• Facilitating uniform compliance between all LSI fleets
• Identifying current zero emission incentive opportunities
• Open to alternatives to achieve the same goal
  – Agriculture
  – Airport GSE
Proposed LSI Regulatory Amendment Concepts

• Registration and Reporting
• Labeling
• Other Minor Regulatory changes
  – Improve clarity
  – Maintain incentive funding availability
Proposed LSI Registration and Reporting Requirements

- Maintain current applicability
  - Forklifts, GSE, sweepers/scrubbers, and industrial tow tractors
  - Large and Medium fleets
- Expand current recordkeeping to a reporting requirement
- Utilize Diesel Off-Road On-line Reporting System (DOORS)
Proposed LSI Labeling

• Propose labeling one label on back of LSI equipment
• Equipment Identification Number (EIN) is white with BLUE background
• Each character will be 3 inches high x 1.5 inches in width
Key Activities and Contacts

• LSI Reporting Amendments
  - Workshops (Summer/Fall 2015)
  - Workgroups as requested
  - Board Item (May 2016)

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Discussion